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Critical Tests with Piperazine Adipate in Horses

BY
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Introduction

IN an earlier publication (Sloan, Kingsbury & Jolly, 1954) it was indicated that piperazine adipate had great potentialities as a veterinary anthelmintic. Extensive clinical trials reported by Hartley (1954) had already shown that the compound could achieve complete eradication of *Enterobius vermicularis* infestation in man.

In the veterinary sphere, the preliminary indications were that besides being a highly efficient ascarifuge for horses, pigs, poultry and a variety of carnivores, piperazine adipate was also very useful against certain bursate nematodes and oxyurids in these hosts. Apart from ascarids the more important worms affected were the small strongyles and *Oxyuris equi* in the horse, the hookworm *Uncinaria stenocephala* in carnivores and the nodular worm *Oesophagostomum dentatum* in the pig.

Confirmation of the value of piperazine adipate as a safe and efficient anthelmintic was quickly forthcoming. Lee (1955) demonstrated outstanding efficiency against *Neoascaris vitulorum*, a hitherto intractable parasite of calves in warm climates, and Poynter (1955) obtained very good results against *Parascaris equorum* and *Trichonema* spp. in horses.

The purpose of the present paper is to amplify the preliminary report already published on experimental work with piperazine adipate in horses, and in particular, to record the results of three critical tests, the most reliable form of anthelmintic investigation.

Method

Six yearling Dartmoor ponies were purchased for these trials. Some carried a light ascaris infestation and all had considerable numbers of oxyurids and small strongyles on arrival. After a first round of dosing they were then further infected by allowing them to graze on a worm-infested pasture and by administration of infective stages of the various common equine nematodes. During the course of a year each pony received a total of four to six anthelmintic treatments with piperazine adipate. The compound was made into a drench by the addition of water and given by stomach-tube. About 300 ml. of water proved suitable for the doses at the 220 mg. per kg. level and 5,000 ml. for the doses in the highest range. On four occasions the compound was given in a bran mash.

Preliminary observations showed that virtually all the worms which were expelled after treatment appeared in the faeces within 48 hours of dosing. Therefore, in the remaining trials the faecal output was examined for 72 hours after dosing to ensure that all eliminated worms would be noted. The larger species, *i.e.*, adult and immature ascarids, adult oxyurids and *Strongylus* spp. were picked out individually by hand and the remaining smaller worms then estimated from well mixed dilution samples, equivalent to 1/20th part of the total faecal output, which were examined in black trays after removal of the colouring matter present by washing over a fine sieve.

In the case of the critical tests all the material was examined twice to make quite sure no worms were overlooked. The bowel contents obtained *post mortem* were examined in the same way as the faeces and the gut wall itself carefully inspected for attached parasites.

The anthelmintic efficiency of the drug was estimated in three ways which can be defined as non-critical, sub-critical, and critical tests.

(*a*) *Non-critical Tests.*—Noting the numbers of worms expelled and comparing pre-dosing faecal egg counts with post-dosing ones made five or six days after treatment. (There is no evidence that piperazine adipate causes any temporary depression in egg-laying activity of nematodes.)

(*b*) *Sub-critical Tests.*—Comparing the numbers of worms expelled by a normal dose of drug with the numbers expelled by a very large dose given about one week later. A small number expelled on the second occasion almost certainly indicated that the first dose had been very effective and this view was supported by data from worm egg counts. These observations were made in conjunction with toxicity tests.

(*c*) *Critical Tests.*—Direct comparison of numbers of worms expelled during the 72 hours after dosing with the numbers found at *post-mortem* examination at the end of this period.

Results

The results of the critical and sub-critical tests are given in Tables I and II. These, together with data from non-critical tests, are briefly discussed below under the headings of the different parasite groups involved.

Parascaris equorum

These were the only worm species which were sometimes markedly altered in appearance when expelled. All immature worms, and the adults produced up to 36 hours after dosing were easily recognisable but

TABLE I

DETAILS OF CRITICAL TESTS WITH PIPERAZINE ADIPATE AT A DOSE RATE OF 220 MG. PER KG. GIVEN BY STOMACH TUBE

Pony	"A"			"B"			"D"		
Weight, kg.	150			136			205		
	Ex.	Pm.	Percentage efficiency	Ex.	Pm.	Percentage efficiency	Ex.	Pm.	Percentage efficiency
Ascaris—immature	0	0	—	34	0	100	0	0	—
Oxyuris—larvae	0	30	0	160	1,907	8	248	999	20
Trichonema spp.	1,366	10	99	30	0	100	1,275	2(a)	c.100
Triodontophorus spp.	1	2	33	1	1	50	4	1	80
Strongylus vulgaris	2	2	50	3	2	60	1	2	33
S. edentatus + *S. equinus*	0	46	0	0	41	0	0	11	0
Anoplocephala perfoliata + *P. mamillana*	0	12	0	0	0	—	0	0	—
Bots—immature	1	16	6	0	2	0	0	17	0

Ex. = Worms expelled during the 72 hours following dosing.
Pm. = Worms found at *post-mortem* examination 72 hours after dosing.
(a) = Five more encysted in bowel wall.

TABLE II

DETAILS OF SUB-CRITICAL TESTS WITH PIPERAZINE. A SMALL DOSE FOLLOWED BY A LARGE ONE A WEEK LATER

Pony	"A"		"B"		"C"		"D"		"E"		"F"	
Dose rate mg. per kg.	400	1,500	400	1,500	250	1,250	250	1,250	250	1,250	250	1,250
Ascaris—adults	2	0	1	0	0	0	1	0	0	0	1	0
Ascaris—immature	21	0	15	0	3	0	0	0	0	1	8	0
Oxyuris—adults	2	0	209	0	85	0	101	1	38	<23•	273	<71•
Oxyuris—immature	135	60	170	180	540	100	461	0	180	40	281	0
Trichonema spp.	1,524	45	591	0	120	0	561	0	180	0	360	40
Triodontophorus spp.	142	0	60	30	6	200	0	0	2	160	7	0
Strongylus vulgaris	0	0	0	0	0	0	0	0	0	0	0	2
S. edentatus + *S. equinus*	1	0	0	0	0	1	0	0	0	0	0	0
Bots	0	0	0	1	0	0	0	0	4	1	0	0

Each figure above is the number of worms expelled for 72 hours after dosing.
All horses had negative egg counts after the second dose.
• Samples badly frozen and estimation difficult. These figures are probably too high.
All doses were given by stomach tube.

adults eliminated after that time were usually partially digested and resembled pieces of brown string.

The results from the critical and sub-critical tests indicate that the drug is 100 per cent. effective against adults and over 90 per cent. against immature worms at dosage levels of 220 to 250 mg. per kg. bodyweight. Additional data from non-critical tests confirmed this view as the following list shows :—

120 mg. per kg.—Failed to expel any of 12 adult worms present in one pony.

220 mg. per kg.—Eliminated 401 immature ascarids from one pony and 40 from another.

250 mg. per kg.—Expelled three adult and four immature worms from one pony, two adult and four immature ones from another and one immature from a third.

c. 300 mg. per kg.—Expelled over 75 adult and 100 immature worms from two young zebras.

400 mg. per kg.—Expelled 12 adult ascarids from one pony.

In all these cases except the first, the post-dosing ascarid egg count fell to nil. It was not possible to be sure whether all the immature specimens present were removed. These latter ranged to as little as 14 mm. in length and it seems likely that ascarids become susceptible to treatment as soon as they reach the gut. The critical test on pony " B " (Table I) in which all were definitely removed by treatment was carried out four weeks after giving an artificial infection and the worms were almost certainly that age at the time.

Oxyuris equi

The adult pin-worms proved more susceptible to treatment than the fourth stage larvae which are much the more numerous in infected horses.

Adults.—The sub-critical tests showed that a dose rate of 250 mg. per kg. was over 80 per cent. effective and 400 mg. per kg. removed all adult oxyurids (Table II). Other tests showed that some worms were expelled at a dosage level of 120 to 150 mg. per kg. and confirmed that 250 mg. per kg. removed the majority present. Altogether about 1,100 worms were expelled as the result of 14 treatments of infected horses.

Immature Worms.—There normally tends to be a continuous natural elimination of the fourth stage oxyurid larvae in the faeces of horses and anthelmintic efficiency figures need to be accepted cautiously. The maximum efficiency observed in the critical tests was 20 per cent. (Table I). In the sub-critical and non-critical tests rather better anthelmintic results were indicated but could not be proven. On 17 occasions 100 or more specimens were eliminated in the faeces after treatment, the maximum numbers found being 924 and 1,700—both from ponies given 250 mg. per kg. bodyweight.

Small Strongyles (*Cylicostomes*)

Trichonema spp. — Trichonemas constitute the majority of the small strongyles found in horses. The results show that at a dose rate of 220 mg. per kg. and upwards piperazine adipate is not less than 89 per cent., and on average over 97 per cent. effective (Tables I and II). Three non-critical tests indicated that a dose rate of 120 to 150 mg. per kg. was too low to give satisfactory control and nine others confirmed that 220 mg. per kg. and over was usually very efficient. Altogether these results showed that the estimate of efficiency reported in our initial trials was too conservative.

Triodontophorus spp.—Only very small numbers were present in the critical tests which indicated that piperazine adipate is about 60 per cent. effective against them at a 220 mg. per kg. dose rate (Table I). The results in the sub-critical tests were varied and it appeared that a 250 mg. per kg. dose was not very effective (Table II). However, 81 and 198 worms were removed by a similar dose on other occasions. When present in numbers these worms occur in clusters in the right dorsal colon and unless sufficient drug is given it may be a matter of chance whether a suitable concentration is reached in any given small locality.

Gyalocephalus spp.—About 40 worms were eliminated from one pony after a 400 mg. per kg. dose.

Strongylus spp. (*Sclerostomes*)

These are much larger and stouter worms than the small strongyles and are normally more resistant to anthelmintic treatment. The most important member of this group, *S. vulgaris*, is also the smallest and proved more susceptible to treatment with piperazine adipate than its congeners *S. edentatus* and *S. equinus*.

S. vulgaris.—The ponies were only lightly infected and the results are not therefore very conclusive. In the three critical tests there was an average of 50 per cent. efficiency at the 200 mg. per kg. dose rate (Table I). Another pony given 220 mg. per kg. expelled 12 worms. These results are similar to the 63 per cent. efficiency against *S. vulgaris* recorded for one critical test at the same dose rate by Poynter (1955).

S. edentatus and S. equinus.—The former of this pair was much the commoner in our ponies which carried moderate infestations with these worms. The critical tests showed that a dose rate of 220 mg. per kg. is completely ineffective against them since none of 98 worms present were removed (Table I). There was also some evidence that a dose rate of three times this amount, *viz.* 660 mg. per kg., was of no value.

Habronema microstoma

Eighty of these small spirurids were found in the stomach of pony " D " at *post-mortem* examination. It seems likely, therefore, that piperazine adipate is not effective against this species.

Tapeworms

No worms were expelled by the treatment given. Eleven *Anoplocephala perfoliata* were found in the caecum and one *Paranoplocephala mamillana* in the small intestine of pony " A " at *post-mortem* examination. Since the drug is known to be ineffective against tapeworms in dogs there can be little doubt that it is also valueless against tapeworms in horses.

Bots (Gastrophilus *spp. Larvae*)

A few bots were eliminated after various dosings in the spring months but the critical tests made in the autumn showed that the drug was not effective against immature forms, only one out of 36 present being removed by the treatment (Table I).

Toxicity

As previously reported the only sign of any toxic symptoms in the horses dosed was a slightly laxative effect at 1,200 to 1,500 mg. per kg. level (Sloan *et al.*, 1954). The very low level of toxicity for mammals is borne out by the fact that the L.D. 50 for mice is 11,400 mg. per kg. (Cross, David & Vallance, 1954). Since these results were obtained piperazine adipate has been used to a considerable extent in veterinary equine practice without any reports of toxicity being received.

Discussion

Anthelmintic Effect

The results reported here are in close agreement with those given by Poynter (1955) and confirm that at a dose rate of 10 g. per 100-lb. bodyweight piperazine adipate will effectively remove adult and immature ascarids and *Trichonema* spp. as well as *Oxyuris* adults, from horses. The drug is quite effective against *Triodontophorus* spp. and probably *Gyalocephalus* spp. too. It has no effect against *Strongylus edentatus* or *S. equinus* but removes 50 per cent. or more of *S. vulgaris*. There is no useful effect against bots or tapeworms and probably none against *Habronema* spp.

When compared with phenothiazine it will be seen that piperazine adipate is nearly as effective against small strongyles and gives approximately the same results against *Strongylus* spp. Gibson (1950) gives a summary of critical tests with 30 g. phenothiazine against *Strongylus* spp. the individual figure quoted being 0, 0, 0, 22 and 48 per cent. for his own trials and 54 and 92 per cent. for trials by Grahame *et al.* (1942). There is no indication in the published work as to which of the *Strongylus* species were involved. In this case it is unlikely that either drug is sufficiently effective to give a biologically valuable reduction in parasite numbers.

The excellent anthelmintic effect against adult and immature ascarids shown by piperazine adipate together with its low toxicity and absence of unpleasant side effects render possible for the first time an opportunity of ridding breeding studs of *P. equorum*. The dosing of stock every seven or eight weeks, together with appropriate hygienic measures, could possibly put this very desirable objective within the reach of the careful stud-managers.

The drug also removes a very high percentage of adult *Oxyuris equi* and a 220 mg. per kg. dose combined with a salt enema should give a virtually 100 per cent. result. Since it is not very effective against immature stages of this species a second dose should be given later if required. It may be observed here that phenothiazine has little or no effect against adult oxyurids but may remove up to about 50 per cent. of immature forms.

Dosage Rate and Administration

The most suitable dose rate appears to be 220 mg. per kg. (10 g. per 100-lb. bodyweight) to a maximum of 80 g. These trials were carried out on small ponies in which the gut volume is proportionately larger than in heavier horses and it does not seem likely that a bigger dose than 80 g. should be required for routine purposes. In special circumstances there seems to be no objection to doubling or even trebling the dose if so required.

The best method of dosing is to give the drug by stomach-tube—80 g. can be given easily in 300 ml. of water—but the majority of animals will take it in a wet bran mash particularly if they are used to this type of food. It may be observed that dogs, cats, pigs and poultry will take piperazine adipate readily in their food and there is no reason to believe that animals find it distasteful.

Summary

1. Piperazine adipate has been shown to be a highly efficient and safe anthelmintic for equines. A dose rate of 220 mg. per kg. (10 g. per 100-lb. bodyweight) will remove nearly 100 per cent. of adult and immature *Parascaris equorum* and adult *Trichonema* spp. The same dose will eliminate 80 per cent. or more of adult *Oxyuris equi* and about 50 to 60 per cent. of *Triodontophorus* spp. and *S. vulgaris*. This drug has no useful effect against *S. edentatus* and *S. equinus* nor against bots. It is also unlikely that it shows any effect against *Habronema* spp. or the anoplocephalid tapeworms.

2. The efficiency against immature as well as mature ascarids may render possible the elimination of these parasites from breeding studs.

3. Results against the horse redworms are approximately equivalent to those achieved by a 30-g. dose of phenothiazine and the likelihood of a diminished risk of a toxic idiosyncrasy may prove a valuable asset where thoroughbred stock are concerned.

Acknowledgment.—The authors wish to express their thanks to Cooper, McDougall & Robertson, Ltd., Berkhamsted, for permission to publish this paper.

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FINED FOR TREATING SICK ANIMALS

Abraham Smith, a steel worker, of Woodview Road, Sheffield, pleaded "Guilty" to three summonses concerning the treatment of dogs recently.

He was fined £3 at Sheffield for practising as a veterinary surgeon when not registered.

In a written statement he said: "I have been treating animals for 40 years and I have charged 8s."

His solicitor, Mr. Kenneth Mitchell, said: "It is because of his love for animals that he finds himself in this position."

Hibitane : a New Disinfectant for the Control of Mastitis

BY
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WHILE carrying out an experiment to eradicate *Str. agalactiae* from over 600 herds in Surrey, although success was achieved in the majority of infected herds, there remained a hard core from which it was difficult to remove the infection. There were two main reasons for this difficulty. One was the presence in these problem herds of cows which did not respond to repeated treatments with penicillin, and the other was that there was spread of infection from these cows to others which, although responding to treatment, were susceptible to re-infection.

It was apparent that if eradication of *Str. agalactiae* was to be successful, this uncontrolled spread throughout the herd had to be stopped and, the cows resisting treatment having been established, it would then be possible to deal with them by other means.

Lancaster & Stuart (1949) had shown clearly the way in which *Str. agalactiae* spread quickly in an infected herd, and Hughes (1953) had also shown that this infection was readily spread by the milkers' hands and udder cloths but less so by the milking machine. This was found to be the case in the Surrey Scheme where the poorest results in eradication of *Str. agalactiae* were achieved in herds which were hand milked or hand stripped after the machine. However, even in some machine-milked herds which were not hand stripped, cases of uncontrolled spread did occur and it was obvious that the hands, udder cloths and teat clusters were the three main vehicles of such transference of infection. To control spread it was essential to avoid as much as possible touching the udders and to ensure that no contaminated article was applied to the udder.

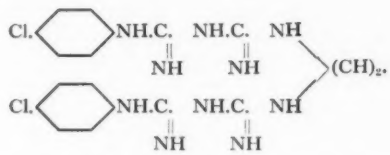
In later experimental work in the laboratory herd at Weybridge, Davidson and co-workers (1954) showed that when a rigid aseptic technique was adopted during milking, spread of infection from infected to non-infected cows could be controlled almost completely even where there was a heavy infection present in the herd. While it is appreciated that such a technique as they used is impracticable under ordinary farming conditions, this experiment did indicate that cows become infected almost entirely when they are being milked.

The need for having the hands, udder cloths and teat clusters free from infection with *Str. agalactiae* before milking each cow prompted the search for a disinfectant which would do this satisfactorily. The disinfectants most commonly used in the cowshed at the moment are the hypochlorites, and while these preparations are most efficient in water free from organic matter, they possess certain disadvantages for use in the cowshed. The addition of only 2 per cent. organic matter inactivates them in a very short time and since a disinfectant used in a cowshed for washing udders and dipping teat clusters is continuously exposed to such organic contamination, their efficiency is seriously impaired. Furthermore, these hypochlorites are often used in excess of the recommended strength and teat sores and sores on milkers' hands are a common sequel when this occurs.

To replace the hypochlorites, the quaternary ammonium compounds were introduced but while these cationic detergents are effective against the gram-positive organisms they are not so active against gram-negative ones. They are also much more expensive to use and have a serious defatting effect on the skin of the teats and milkers' hands.

The properties of a disinfectant necessary before it can be used in a cowshed are that it should be non-toxic, non-irritant, odourless, capable of killing a high percentage of organisms rapidly, gram-positive and gram-negative alike and it must be economical to use.

A compound which appeared promising was a substance called Compound No. 10,040 or Hibitane. This compound is a diguanide having the formula



A description of its properties is given by Davies and his co-workers (1954).

Since this compound was claimed to be bactericidal to both gram-positive and gram-negative bacteria even in the presence of organic matter, it was decided to try the effect of using it in controlling the spread of *Str. agalactiae* in a number of herds, where, over a period of at least three years it had been impossible to eradicate the infection, despite treatment of every infected cow as soon as it was discovered.

The strength of 10,040 used for this preliminary trial was 1 : 5,000 and this was combined with alkyl aryl polyether alcohol at 1 : 10,000. The reasons for this combination was two-fold. Firstly, 10,040 is relatively insoluble in water and it can be kept in a concentrated form only if combined with a good solvent such as this is. Secondly, since 10,040 is not of itself detergent, it was thought that the addition of this solvent with its detergent properties would assist in cleaning the udders. Even though the disinfectant was used for over a year in three of the herds there were no harmful effects on the milkers' hands or cows' teats from this detergent action.

The formulation of the solution was changed subsequently. This had the effect of increasing slightly the solvent content of the solution in the final dilutions and in a later trial one girl reported sores on the hands and arms after its use.

Five herds were chosen for this field trial with a control herd in one case. The disinfectant was supplied in the form of a 5 per cent. solution and in each herd the cowman was provided with a measure which would indicate the amount to be added to two gallons of water to make 1 : 5,000 solution of the disinfectant.

The disinfectant solution was used to wash the cows' udders and to disinfect hands or teat clusters before milking each cow. The solution was not renewed when the cows' udders were not muddy but it was left to the discretion of the cowman when to use a further bucket of disinfectant.

Four methods were used to determine the value of the disinfectant for cowshed hygiene.

(1) The effect of 10,040 in preventing spread when no treatment of infected cows was carried out.

Herds "A" and "B" had been under supervision from Weybridge since 1947. They had been hand milked originally but were changed to machine milking six months before the disinfectant was introduced. In these herds 10,040 was used for washing the udder and for disinfection of the teat clusters but for two years no treatment was given to any infected cow unless there were clinical symptoms. Periodically freshly-calved cows were introduced which were infected with *Str. agalactiae* but the spread of infection was minimal. Eventually each infected cow was treated as it was discovered and both herds were freed from infection in a very short time.

(2) The effect of using 10,040 intermittently.

Herd "C" was a machine-milked herd which had been under our control since 1949 and was an exceptional herd in that spread of infection was extremely rapid. Unless every infected cow was treated immediately, the infection-rate in the herd returned to its original extent very quickly. From 1949 to 1951 this herd was "blitzed" three times but infection persisted. 10,040 was introduced and immediately the main section of the herd, which was milked in a large double shed, became free from infection but in a group of 12 cows milked in another shed, the infection persisted in a few cases. The disinfectant was then discontinued and spread of infection again occurred. This was repeated a second time and finally the infection was eradicated after the 10,040 had been introduced for a third time by the disposal of one chronic cow and the special treatment of two others.

(3) The effect of using three different disinfectants in turn in one herd.

Herd "D" was a hand-milked herd which was first examined in 1949 and found to have 30 cows out of 38 infected. The herd was "blitzed" and the major part of the infection removed but a significant amount still remained. The disinfectant used at this stage was a hypochlorite. In 1951, in an attempt to stop the spread of infection, Cetrimide was introduced and persisted with for nearly two years. This produced no improvement and sores both on the teats and on the milkers' hands were a problem. In January, 1953, the Cetrimide was discontinued and 10,040 was introduced. The spread of infection was stopped immediately and although during the following months on four occasions an infected cow was introduced and there was present in the herd a cow with a chronically infected teat sore, no spread occurred from these cows and the herd became free from infection. At this stage the supply of disinfectant to this herd was discontinued. When re-examined after a further eight months it was found that 19 cows were again infected with *Str. agalactiae*. It has not been possible to trace the source of intro-

TABLE I

HERDS A AND B

	Months from introduction of disinfectant ...	—11	—4	—1	+1	+2	+3	+4	+5	+7	+9	+11	+13	+15	+18
A	Number of cows ...	42	40	42	38	44	45	44	35	41	38	42	41	40	37
	Number infected with *Str. agalactiae* ...	8	9	12	6	xxxx 9	8	6	6	2	x 3	3	1	x 2	x 3
B	Number of cows ...	28	25	29	28	25	36	37	26	26	24	24	28	25	32
	Number infected with *Str. agalactiae* ...	7	5	6	3	4	4	3	4	3	3	2	3	—	x 4

*

	Months from introduction of disinfectant	+20	+23	+25	+27	+29	+30	+31	+33	+34	+35	+36	+37	+49
A	Number of cows	44	30	43	44	40	36	35	43	45	41	34	39	24
	Number infected with *Str. agalactiae*	1	xx 3	3	1	1	xx 2	1	1	—	—	—	—	—
B	Number of cows	30	27	26	20	24	27	24	23	25	26	25	29	23
	Number infected with *Str. agalactiae*	3	x 4	xx 6	2	4	x 5	4	4	1	—	—	—	—

x Newly calved infected cow introduced. * Disinfectant introduced. T T Cows treated.

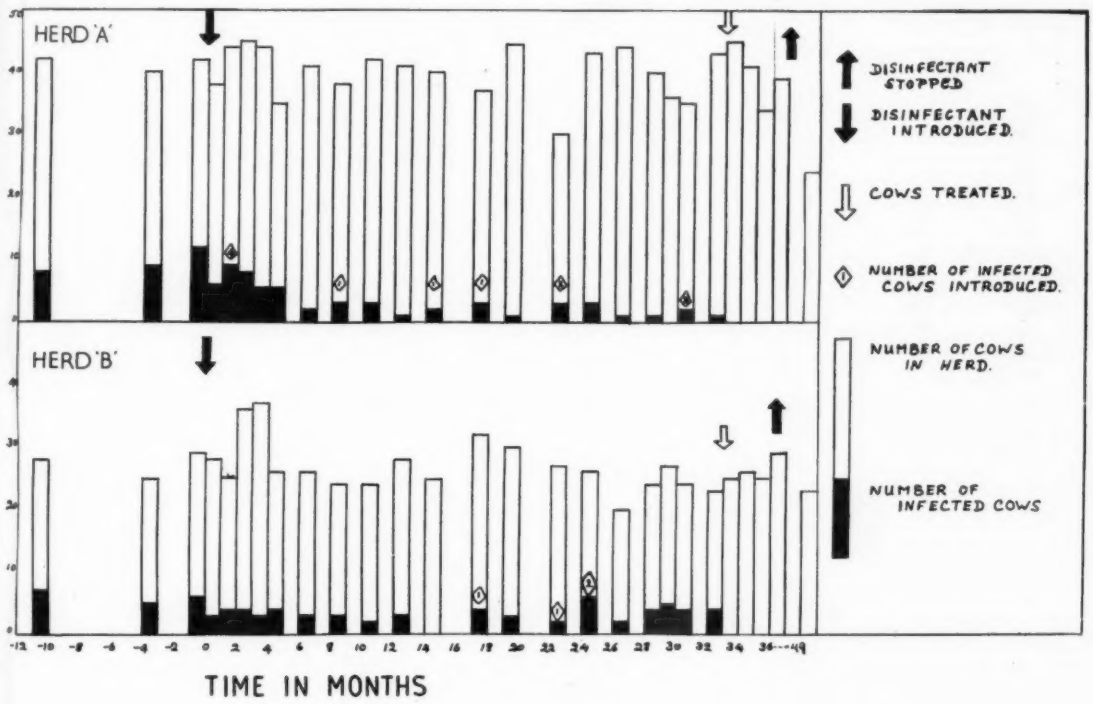


TABLE II
HERD C

Months from introduction of disinfectant	—5	—4	—2	1	+1	+2	x +3	+4	x +5	+6	+7	+9
Number of cows	30	30	31	31	26	29	32	32	32	34	36	32
Number infected with *Str. agalactiae* ...	7	11	7	13	4	3	13	9	4	4	9	7

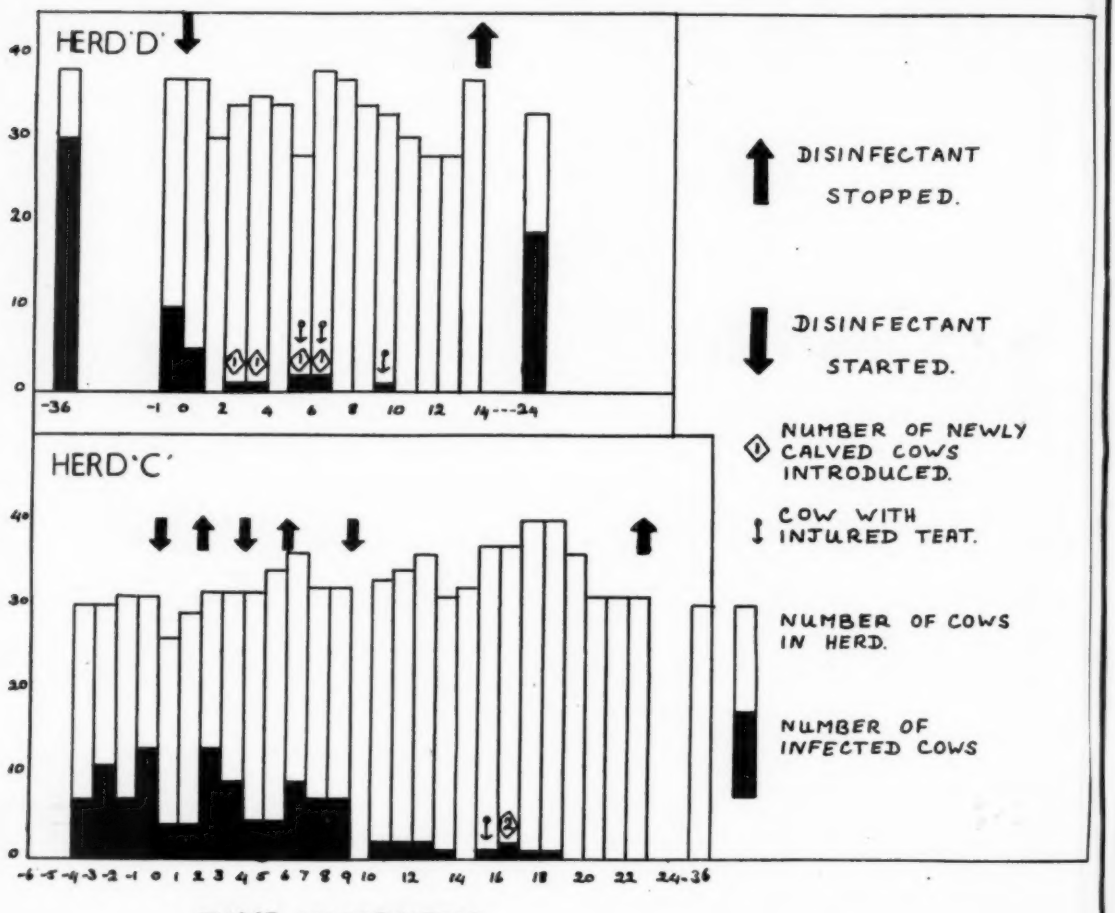
Months from introduction of disinfectant	* +11	+12	+13	+14	+15	□ +16	+17	* +18	+19	□ +22	+23	+36
Number of cows	33	34	36	31	32	32	37	40	40	36	31	30
Number infected with *Str. agalactiae* ...	2	2	2	1	—	o 1	xx 2	1	1	—	—	—

xx Newly calved infected cows introduced. o Cow with injured teat which was operated on.
* Disinfectant introduced. □ Disinfectant stopped.

TABLE III
HERD D

Months from introduction of disinfectant ...	—36	—1	* +1	+2	+3	+4	+5	+6	+7	+9	+10	+11	+12	+13	+16	□ +24
Number of cows	38	37	37	30	34	35	34	28	38	37	34	33	30	28	37	33
Number infected with *Str. agalactiae*	30	10	5	—	x 1	x 1	—	xo 2	xo 2	—	—	0 1	—	—	—	19

x Newly calved infected cow. o Cow with injured teat. * Disinfectant introduced. □ Disinfectant stopped.



duction of this infection with any certainty but the rapid spread after the withdrawal of the disinfectant shows clearly how well this spread had been controlled during its use.

(4) The effect of 10,040 compared with hypochlorite in a control herd.

For this experiment two herds were chosen which were under the same ownership, of the same breed and were hand milked. In both herds the spread of *Str. agalactiae* had been prevalent for three years despite frequent examinations and treatment of each infected cow as it was discovered. In one herd (Herd " E "), 10,040 was used while in the control herd hypochlorite was used. Both herds were examined once a month and all cows found to be infected were treated with penicillin. There was no reduction in infection in the control herd while in the herd in which 10,040 was used, there remained only one cow which resisted treatment. Despite the presence of this persistent source of infection there was no spread to the other cows during a period of seven months, after which the experiment was discontinued.

Discussion

In any trial of a disinfectant to estimate its ability in controlling the spread of *Str. agalactiae* throughout a herd, two essentials are that there must be a permanent source of infection in the herd, *i.e.*, a chronically infected cow or cows, and it must be shown that this infection will normally spread from such cows to others in the herd. In the case of the herds chosen, as will be seen from a study of the tables, these conditions did obtain.

As mentioned above, the strength at which the 10,040 solution was used was 1 : 5,000 but in calculating the cost to the farmers it was considered that it would be too expensive for general use in the cowshed at this strength. Accordingly, it was decided to carry out a further trial at a higher dilution which would be comparable in cost to the disinfectants at present in use in the cowshed. This trial is in progress at the moment and it is hoped to publish the results of this experiment at a later date.

Summary

A new disinfectant, which is claimed to be bactericidal

(Concluded at the foot of col. 1, p. 650.)

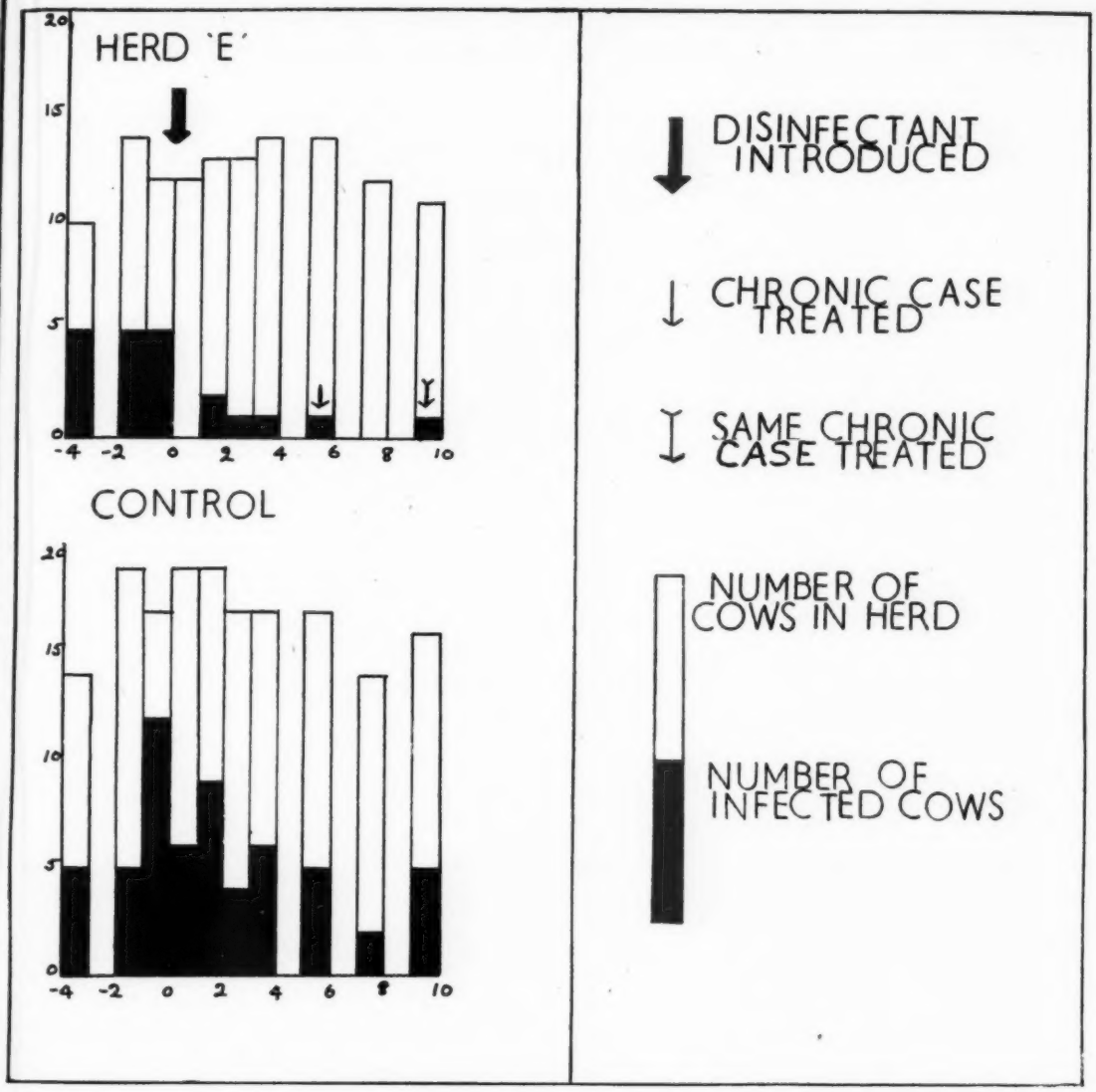


TABLE IV
HERD E AND CONTROL HERD

	Months from introduction of disinfectant ...	—4	—2	—1	+1	+2	+3	+4	+6	+8	+10
Herd E	Number of cows	10	14	12	12	13	13	14	14	12	11
	Number infected with *Str. agalactiae* ...	5	5	5	—	2	1	1	x 1	—	xx 1
Control	Number of cows	14	19	17	19	19	17	17	17	14	16
	Number infected with *Str. agalactiae* ...	5	5	12	6	9	4	6	5	2	5

*

x Chronic cow now treated. xx Same chronic cow infected but no spread. * Disinfectant introduced.
Herd E = Hibitane. Control herd = Hypochlorite.

Aortic Rupture in Turkeys Subsequent to Dissecting Aneurysm

BY

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Introduction

INTERNAL haemorrhage appears to be a common cause of death in turkeys. As far as we are aware, the first reference to this condition was that of Durell, Pomeroy, Carr & Jerstad (1952), who described it as occurring under various systems of management in widely separated parts of the United States. They mentioned a wide variation in age incidence, but agreed that the condition was most common in well grown male birds and that the haemorrhage usually originated from the region of the kidneys. A more detailed description of the condition was given by McSherry, Ferguson, & Ballantyne (1954), who studied a number of outbreaks in Ontario, Canada. They described the presence of large blood clots in the abdominal cavity and over the left kidney, and showed that these originated from a rupture of the posterior aorta subsequent to a dissecting aneurysm. Carnaghan (1955) has reported the occurrence of an apparently identical condition in Great Britain. He, too, found a dissecting aneurysm at the site of the aortic rupture, but he also described the presence of an atheromatous thickening of the intima at this point. A similar atheroma was found in the posterior aorta of an apparently healthy turkey.

During the past year we have encountered a number of outbreaks of a condition that appears to be identical with that described above and the following observations are offered as providing some additional evidence as to its incidence and possible aetiology.

History

In 1954 the condition was seen at Cambridge in seven turkeys received from four flocks and at Wye in seven turkeys from two flocks. The condition has not been observed at Wye before but records at Cambridge show that similar internal haemorrhages were seen on three occasions in 1953 and that there was at least one case in 1952. The actual source of the haemorrhage was not determined in these earlier cases.

Symptoms

With one exception, owners reported that the affected birds had been found dead and that no premonitory symptoms had been observed. The affected birds were all in good condition, above the average for their batch, and could be recognised by the marked pallor of the head and neck. A few had bled from the mouth, which contained large blood clots.

The exceptional history was provided by one flock in which losses from internal haemorrhage occurred in 1953. These were almost certainly due to aortic rupture but a detailed history was not obtained until a year later. The stockman then stated that the affected birds had been weak and staggery, with cold extremities, for 24 to 48 hours before death.

Age Incidence

In the six outbreaks confirmed during 1954, losses from internal haemorrhage occurred in birds 11 to 24 weeks old. Most affected birds were between 16 and 22 weeks old.

The four outbreaks diagnosed retrospectively as having occurred in 1952 and 1953 showed an age incidence of 17 to 21 weeks.

Breed and Sex Incidence

So far the condition has been seen only in Broad Breasted and American Mammoth Bronze birds.

All 14 of the turkeys in which aortic rupture was diagnosed in 1954 were male birds. In three outbreaks, some of the birds which had died suddenly were opened by the owners and found to show evidence of internal haemorrhage ; the great majority of these

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against both gram-positive and gram-negative bacteria, was used as an udder wash and for disinfecting the hands and teat clusters in five herds.

Although all five herds and histories of persistent infection with *Str. agalactiae* due to the presence of chronically infected cows, with the aid of this disinfectant it was possible to prevent spread of infection from those cows to others in the herd. Four herds were freed entirely from infection, either by removal or special treatment of the chronically infected cows. After the disinfectant had been discontinued, in one of these herds there was an unexplained reintroduction of infection which spread to more than half of the cows within eight months. The three other herds were still free from infection 12 months after the last supply of disinfectant had been used. In the fifth herd infection was confined to a single chronic case, while in a control herd, using hypochlorite, spread of *Str. agalactiae* continued.

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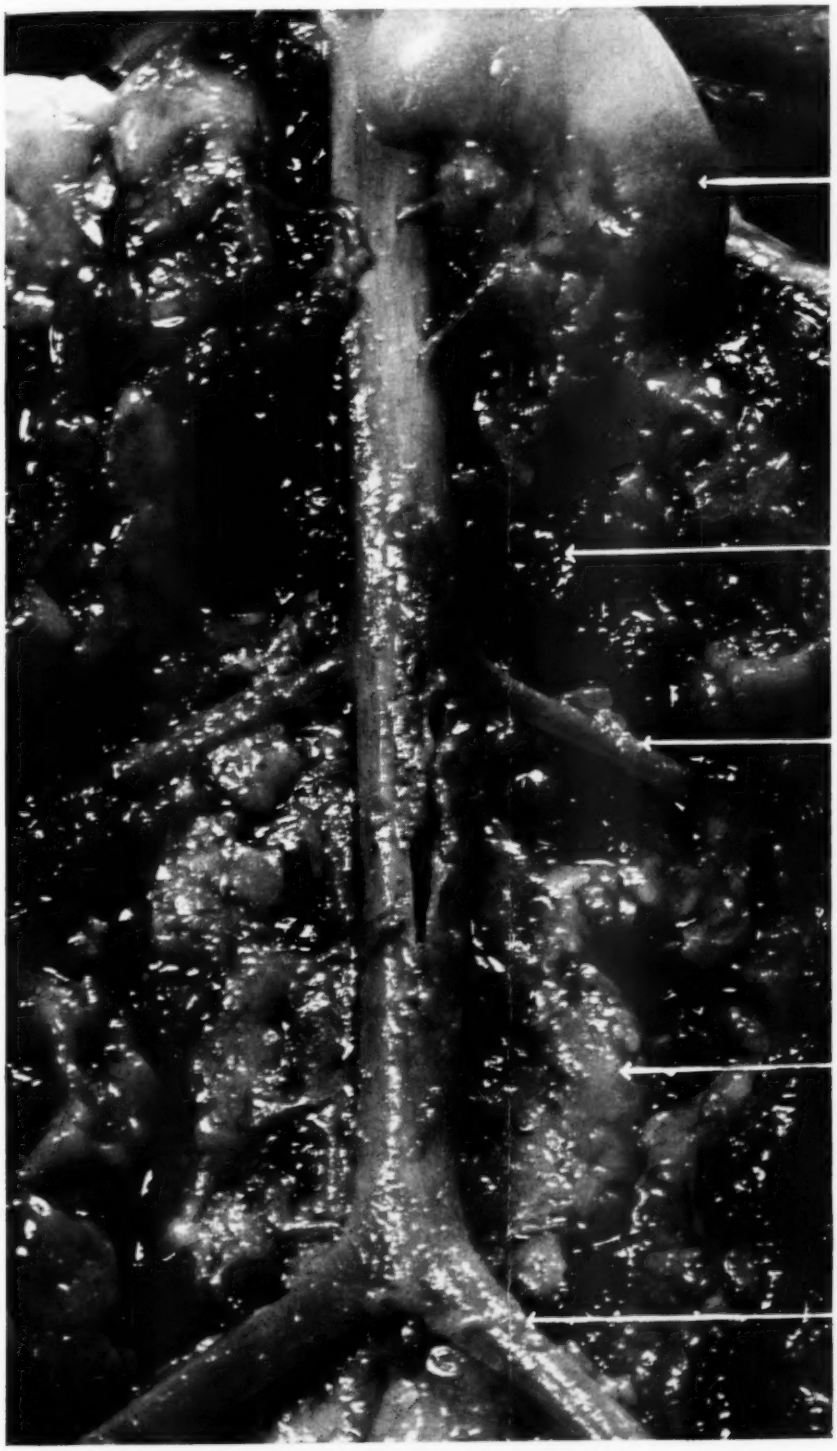
GIBSON, E. A., & DE GRUCHY, P. H.—AORTIC RUPTURE IN TURKEYS SUBSEQUENT TO DISSECTING ANEURYSM

FIG. 1.—POSTERIOR AORTA OF TURKEY, SHOWING TYPICAL POSITION OF AORTIC RUPTURE.



As indicated above, the various lobes of the kidneys show as white areas and the perirenal blood clot as dark areas.

FIG. 2. THE ENDOTHELIAL SURFACE OF A RUPTURED AORTA.

Area of endothelial erosion with adherent thrombus

Rupture

Three atheromatous plaques are indicated by arrows

birds were males. Other birds which had died suddenly at about the same time remained unexamined ; these, too, were nearly all males.

None of the six flocks in which aortic rupture was diagnosed in 1954 had employed either surgical or chemical caponisation. The latter had been used in one of the three flocks affected in 1953. Here the birds were implanted about seven days before the losses commenced.

As indicated above, we were seldom able to examine the carcases of all the birds that died in these outbreaks and often several deaths occurred before laboratory aid was sought. In such cases one was unable to rule out the possibility that some other disease was concurrently present. The presence of such concurrent disease was established in two flocks ; blackhead in one and erysipelas infection in the other. In some flocks, however, the owners were able to report that they themselves had opened carcases and found evidence of internal haemorrhage.

When these points are borne in mind it seems that mortality rate can vary from less than 1 per cent. to about 5 per cent. or more.

The following histories are typical of this condition.

Flock C.—Only one death in a flock of 25 turkeys. Confirmed as aortic rupture.

Flock E.—Twenty-seven sudden deaths in a flock of 500 turkeys. Aortic rupture confirmed in one bird, and internal haemorrhage demonstrated in 11 others. Some subsequent deaths were shown to be due to erysipelas infection. Thus the losses from aortic rupture were probably between 2 and 5 per cent.

Flock H.—Twelve sudden deaths in a pen of 180 birds. Four were shown to be cases of aortic rupture, and internal haemorrhage was demonstrated in five other birds. Thus the losses from aortic rupture were probably between 5 and 7 per cent.

Post mortem Findings

The 14 cases which we encountered in 1954 showed very similar findings. In every instance the carcase was that of a well-grown male bird in good condition. Three of the turkeys showed large blood clots in the mouth. The heads and necks were pale, as were the carcase muscle and internal organs.

With one exception, examination of the body cavity showed the presence of large blood clots lying among the intestines together with a quantity of haemorrhagic serum. The kidneys were covered by a blood clot which was invariably thicker and more extensive over the left kidney. In the one exceptional case the clot surrounded the base of the heart and extended into the subcutaneous tissues of the neck.

In nearly every case, dissection of the perirenal clot disclosed the presence of a tear in the ventral wall of the posterior aorta, between the external iliac and sciatic arteries (Fig. 1). In one case, however, the tear was in the sciatic artery. These tears were from 8 to 17 mm. long. Those involving the posterior aorta were invariably on the left side of that vessel, although one case was seen in which the tear was on the right. In the single case in which the sciatic artery was involved the tear was on the dorsal surface of the artery.

The edges of the tears showed a separation of the layers of the aortic wall. This separation extended for 1 to 2 mm. around the tear. In some turkeys the lumen contained an organised, adherent thrombus at the point of rupture, while in others the endothelium was thickened by small, irregular atheromatous lesions. These were about 1 mm. in diameter, grey-white in colour, and of a slightly gritty consistency when cut (Fig. 2).

In the three birds that had bled from the mouth it was found that in addition to the abdominal lesions the lungs were filled by blood clots. In two instances both lungs were affected, but in the third only the left lung was involved. Blood clots were also present in the trachea. In one of these birds, removal of the lungs showed the presence of blood clots along the course of the intercostal nerves, extending for about 1 c.m. from the intervertebral foramina. Bacteriological cultures were prepared from the heart blood and liver of every affected bird, and sometimes from the spleen, but the results gave no evidence of any significant bacterial infection.

Histopathology

As nearly all the cases examined showed apparently identical lesions, only a proportion were examined histologically. Paraffin sections were prepared and stained with Ehrlich's haematoxylin and eosin and by the Weigart-French and Verhoeff's methods.

These sections showed changes similar to those described by Carnaghan (1955) and comparison with some of his preparations left no doubt that the lesions were essentially the same.

In the region of the rupture, the aortic lumen contained an early white thrombus, which consisted of strands of fibrin with numerous leucocytes and platelets but very few erythrocytes. This thrombus was adherent to the intima at one or two points where the endothelium was ulcerated. The greater part of the intima showed fatty atheromatous changes, while, in some areas, the presence of fan-shaped clefts indicated where deposits of cholesterol had been dissolved out during the preparation of the material. In other areas, the intima was thickened and degenerative and contained purple-staining deposits of calcium salts. The media also showed evidence of degeneration, as indicated by its poor staining affinity, by the loss of nuclei and by fragmentation of the elastic fibres.

At the point of rupture, the blood had penetrated through the torn intima into the media and, by spreading laterally, had dissected it away from the external elastic lamina. This dissection extended for about half the circumference of the aorta. Some minor, subsidiary dissections were present between the fibres of the external elastic lamina and had caused the fragmentation of some of these fibres.

The rupture of the external elastic lamina and adventitia did not always occur opposite the rupture in the intima, suggesting that the lesions may have developed in two stages. This suggestion was supported by the fact that the new channel within the media tended to be lined by endothelial-like cells, indicating that it had existed for some little time before the occurrence of the final rupture. The presence of the early white thrombus in the aortic lumen also supported this view.

Investigation of Possible Aetiological Factors

In considering these factors, we have included the four cases which were diagnosed retrospectively as having occurred in 1952 and 1953.

As stated above, all the affected turkeys were male birds of the Broad Breasted or American Mammoth Bronze breeds. Most were from 16 to 22 weeks old.

The affected birds came from different breeders. This makes it seem unlikely that the condition has a genetic basis, although it has not been possible to check on the origin of the stock of the breeders concerned.

Housing

In most outbreaks the birds were housed intensively on verandas, although in two instances they were in straw-littered pens. The affected batches did not appear to be unduly overcrowded. Only one case was seen in birds on open range. There is some further evidence that the incidence of the condition is lower in birds at range in that, in one flock, losses from aortic rupture reached a level of at least 6 per cent. among turkeys housed on verandas, but ceased within two or three days of their being turned out to grass.

Diet

The condition occurred on a variety of proprietary and home-mixed rations, which were usually available *ad lib.* In most cases an ample supply of green food was given, but four of the more severe outbreaks occurred in the absence of green food. We found no evidence to support the suggestion of McSherry *et al.* (1954) that the condition is associated with the use of diets with an unusually high protein level. Thus, analysis of one home mixed mash, fed *ad lib.* as the sole item of diet, showed a crude protein content of 18 per cent. In two other instances, pellets containing 18 and 20 per cent. of crude protein were fed mixed with about a third of their weight of wheat. These protein levels are within the range usually recommended in this country for turkeys of this age.

Medication

Since the impression had been gained that the incidence of aortic rupture had increased of recent years, the possible relationship of the condition to certain practices that have come into common use during that period were investigated. These are the use of chemical caponisation, the addition of antibiotics to the food, and the routine use of prophylactic agents against blackhead and coccidiosis.

As already mentioned, chemical caponisation had been used in only one of the 10 affected flocks. Similarly, only two flocks had received antibiotics (penicillin) in the food and only these two had been given prophylactic treatment (nitrofurazone) for coccidiosis. Prophylactic treatment for blackhead was more common, in that three flocks had received routine treatment with arsenicals.

Management in the Brooder

Some interesting evidence was provided by flock H, which consisted of two batches of birds bred from the same flock-mated pen. The first batch, comprising 350 poults, suffered 30 losses in the brooder stage. These were attributed to overheating. Only one death —due to blackhead—occurred subsequently. The second batch, comprising 300 poults, was hatched three weeks later. At about four days old these birds were accidentally left without heat overnight. Eighty poults were found dead the next morning, and many of the others became stunted and weakly. At 18 weeks of age, the losses in this batch had reached 50 per cent. At first, these losses were among the smallest, weakest poults, but between the 15th and 18th week 12 of the best stag birds died suddenly. Nine of these were examined *post mortem*. All nine showed an internal haemorrhage.

Trauma Due to Fighting

The first few cases encountered showed bare lacerated backs due to feather-picking and fighting, but this was not a constant feature of the condition.

A summary of the distribution of these various factors among our 10 field outbreaks is given in Table I (*page 653*).

Discussion

In man, dissecting aneurysms occur predominantly in males past middle age. The most common site is the ascending aortic arch, just above the aortic valves. Hall (1948) states that most cases of dissecting aneurysm are due to various types of degenerative changes in the media, although tears of the intima, or defects such as an atheromatous ulcer may be occasionally the site of rupture. Willis (1950) expresses a similar opinion. Hypertension is also a common forerunner of dissecting aneurysm. Syphilis is rarely, if ever, the cause of the condition, although it is the commonest cause of fusiform and saccular aneurysms of the aortic arch. Anderson (1948) states that a mucoid degeneration of the aortic media, leading to spontaneous rupture or dissecting aneurysm, has been described in cases of induced hypothyroidism.

Dissecting aneurysms appear to be uncommon in domestic and other animals, and the condition is not mentioned by Hutyra, Marek & Manninger (1949). Ponseti & Baird (1952), however, have reported the occurrence of dissecting aortic aneurysms in white rats fed a diet containing 50 per cent. of sweet pea (*Lathyrus odoratus*) seeds.

Our enquiries into the incidence of dissecting aneurysms in turkeys suggest that the condition has occurred in this country for many years, although the nature of the lesion has remained unrecognised until recently. It is probably unusual for the condition to cause heavy losses in any one flock, but it may account for many sporadic deaths. As the affected birds are invariably well grown and in good condition, even these sporadic deaths must cause considerable economic loss to the industry.

It does not seem possible, at this stage, to draw definite conclusions as to the causation of the condition or to explain the age and sex incidence and almost constant predilection site which were the most striking features of this series.

The presence of atheromatous lesions adjacent to the dissecting aneurysm appears to support the suggestion of Carnaghan (1955) that these lesions may be associated with the initial rupture of the intima, and Hall (1948) and Willis (1950) state that a similar aetiology may obtain in some cases of dissecting aneurysm in

man. It is also possible that the degenerative changes that were present in the muscle fibres of the media represented the primary lesion, and in support of this Hall (1948) and Willis (1950) consider that most cases of dissecting aneurysm in man originate from degenerative lesions of the media. Hall (1948) states that the cause of medial degeneration remains obscure, although some experimental work suggests that they may be due to the action of bacterial toxins.

As far as we know, no survey has yet been made of the incidence of atheromatous lesions in turkeys, although these have been reported to be common in the aorta of apparently normal chickens receiving normal diets (Horlick & Katz, 1948 and 1949; Lindsay & Chaikoff, 1950.).

Experimentally, it is easy to produce degenerative lesions in the aorta of chicks by feeding a cholesterol-rich diet, and this effect can be modified by the addition of various substances to the diet. Thus, for example, it is enhanced by the addition of pyridoxine (McFarland, 1953) and diminished by the addition of potassium iodide (Turner, 1933) or soya bean sterols (Peterson, Nichols & Shneour, 1952). The formation of atheromata in chickens is also favoured by the subcutaneous implantation of diethyl-stilboestrol, which increases the lipoid content of the blood serum (Horlick & Katz, 1948). As already mentioned above, however, chemical caponisation with a synthetic oestrogen had been used in only one of the 10 affected flocks.

It is possible that dietary factors similar to those described in chickens would also influence the formation of atheromatous lesions in turkeys. Thus, if the formation of dissecting aneurysms is, in fact, associated with the presence of atheromata, one might expect to

TABLE I
THE DISTRIBUTION OF VARIOUS FACTORS

	Flock A	B	C	D	E	F	G	H	I	J
Date of losses	1952	1953	1953	1953	1954	1954	1954	1954	1954	1954
Breed	A.M.B.*	A.M.B.	A.M.B.	A.M.B.	B.B.B.†	A.M.B.	B.B.B.	B.B.B.	B.B.B.	A.M.B.
Housing	Range	Veranda	Veranda	Veranda	Veranda	Veranda	Veranda	Pens	Veranda	Veranda
Availability of Food	Restricted	*Ad lib.*	Restricted	*Ad lib.*	*Ad lib.*	*Ad lib.*	Restricted	*Ad lib.*	*Ad lib.*	*Ad lib.*
Provision of green food	+	+	+	+	—	+	+	—	—	—
Use of antibiotics in food	—	—	—	—	+ (Penicillin)	—	—	—	+ (Penicillin)	—
Prophylactic treatment against coccidiosis	—	—	—	—	+ (Nitrofurazone)	—	—	—	+ (Nitrofurazone)	—
Prophylactic treatment against blackhead	+ (Arsenical)	—	—	+ (Arsenical)	—	+ (Arsenical)	—	—	—	—
Chemical caponisation	—	+	—	—	—	—	—	—	—	—
Losses attributable to aortic rupture	Not known	At least 6%	4% (1 out of 25)	At least 3%	2-5%	At least 1%	At least 2%	3-4%	1-2%	6% (3 out of 50)
Age incidence	Not known	18 to 21 weeks	19 weeks	17 to 19 weeks	11-22 weeks	19 weeks	21 weeks	15 to 18 weeks	17 to 24 weeks	22 weeks
Remarks	—	Symptoms shown for 24 to 48 hours before death. Losses ceased when turned out to grass	—	Other deaths occurred but were probably due to cannibalism	Erysipelas infection also caused losses	Blackhead infection also caused losses	—	Losses associated with chilling in brooder	Associated with enlarged hock disease	—

* American Mammoth Bronze. † Broad Breasted Bronze.

find some correlation between the incidence of dissecting aneurysms and the diet or nutritional status of the affected turkeys. No detailed analyses of the various diets are available, but the suggestion appears to be supported by the fact that all the affected turkeys were well grown birds in better condition than most of their pen-mates.

In discussing the histopathology of this condition, it is stated that there was some evidence that the final, fatal rupture of the adventitia and external elastic lamina of the media occurs some little time after the formation of a dissecting aneurysm, and it will be appreciated that once such an aneurysm had formed, any external trauma or any factor that raised the arterial blood pressure would tend to precipitate the final rupture. Thus, it was found that in one flock losses from internal haemorrhage tended to coincide with the weekly delivery of feeding stuffs. One occasionally hears of other instances in which turkeys are said to have died from heart failure following some unusual excitement. Some of these cases may, in fact, be cases of aortic rupture.

The marked age and sex incidence may be partly due to the fact that injuries from fighting and sexual play are most frequent in male birds approaching sexual maturity, although, as stated previously, the presence of obvious external injuries was not a constant feature at *post-mortem* examination. The sex incidence may also reflect the faster rate of growth of the male bird. We have not yet seen the condition in an adult male breeding turkey, but this may be because these are few in number compared with fattening birds.

The almost constant predilection site of the aneurysm suggests that there may be some inherent weakness of the aortic wall at this point, but it is interesting to note that Lindsay & Chaikoff (1950) found that spontaneous atheromata of the abdominal aorta occurred mainly in male chickens, whereas in females the thoracic aorta was chiefly affected.

Summary

A condition of dissecting aneurysm of the posterior aorta of turkeys is described. This condition occurs predominantly in well-grown male turkeys of about 12 to 24 weeks of age. The aetiology remains obscure, but the disease is associated with the presence of defects of the wall of the artery. These defects may be associated with dietary factors.

Acknowledgments.—We wish to thank Mr. H. I. Field and Mr. A. R. Jennings, of the Department of Animal Pathology, Cambridge, for their helpful criticism of this paper, and Mr. J. D. Paterson, of Wye, for his encouragement. For the histological preparations we are again indebted to Mr. Jennings, and also to Mr. L. M. Markson, of the Veterinary Laboratory, Weybridge.

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THE NORTH OF IRELAND VETERINARY ASSOCIATION

The local Association is honoured and delighted to play host to the Annual Congress of the B.V.A. and hopes that this Congress will be not only instructive but a happy and memorable one. The previous Congress in 1935 was a highlight in its history.

The President for 1955 is Professor H. G. Lamont, the Honorary Treasurer Dr. D. Luke, the Honorary Secretary Dr. J. K. L. Pearson and Assistant Honorary Secretary Mr. W. A. M. Gordon.

The virility of the profession is reflected in the strength and standing of the North of Ireland Veterinary Association. The total number of veterinary surgeons in Northern Ireland is just over 200 and of these 185 are members of the "North of Ireland," an area representation which few other associations can show.

In Northern Ireland members do not just "belong" to their Association. They take an active interest in it and although the practices in the main are single-handed ones, a 50 per cent. attendance at meetings is quite usual. Indeed, if one allows for members who are in the "sere and yellow" the percentage of active members attending is much higher.

The North of Ireland Veterinary Association was founded in 1907 and is therefore a comparatively young association. The first president was Mr. J. J. Ross, of Belfast, with Captain J. Gregg, Belfast, as Hon. Secretary.

The late J. Ewing Johnston was President for 11 successive years, and several sons of the original foundation body are actively carrying on the good work and traditions of the Association; 120 members are members of the B.V.A. and these form the North of Ireland Division. It is hoped that as the result of the 1955 Congress membership of the B.V.A. will be further strengthened.

The Association has just acquired its first Presidential Chain of Office with the names of all previous Presidents recorded on the collarette. This was invested on the President on August 16th, by Mr. H. C. I. Kelly, an Honorary Member and Past President of the Association, and Honorary Treasurer for 25 successive years.

Professor Frederick Blakemore—A Memoir

FREDERICK Blakemore, B.V.SC., D.V.SC., M.R.C.V.S., D.V.S.M., Director of Veterinary Studies and Professor of Veterinary Medicine in the University of Bristol, died suddenly at his home in Langford on Sunday, August 7th, 1955, in his 50th year. He leaves a widow and three sons.

The tragedy of this event will be deeply felt in the many spheres in which he moved and to which he contributed so much. Of distinctive personality, never ostentatious, always kindly and considerate, Blakemore had many charms. He was always happy in home and garden and in command and at ease in the laboratory, at the desk, or in the field. He was a really true and outstanding member of the veterinary profession, a profession which he conceived should never be insular in outlook. How well he lived up to this ideal is evidenced from the reputation he enjoyed among men of the arts and sciences.

A graduate of the Liverpool School in 1927, which University honoured him with a Doctorate of Veterinary Science in 1950, Blakemore proceeded to Manchester where he took the Diploma in Veterinary State Medicine. From here he went as an assistant in general practice to T. Wilson of Nantwich. Having thus sampled the opportunities of a veterinary career he was for a short time Veterinary Officer of the Glamorgan County Council, but in 1931 he left Wales to join the Veterinary Investigation Service of the Eastern Provinces stationed at the Institute of Animal Pathology attached to the University of Cambridge. Here his duties were concerned with routine laboratory work, diagnosis and field investigation over a wide area of agricultural importance. He was thus provided with a unique opportunity, accepted in full, of acquiring knowledge of disease problems. When the National Agricultural Advisory Service was formed in 1946 the Veterinary Investigation Service was attached to the Animal Health Division of the Ministry, and Blakemore was invited to accept the senior appointment in this service for England and Wales, which post he retained until 1948.

It was during these 17 years at Cambridge that Blakemore's marked ability came to the fore. His agricultural background, gained in his youth in Cheshire, State Medicine training, and experience in practice had paved the way, and now in the Eastern Provinces as a member of staff of the Institute of Animal Pathology his potential began to develop. He kept close contact also with the Science Departments of the University, particularly the Department of Pathology and the School of Agriculture, in which School he lectured in Animal Hygiene and subsequently examined in this field for the University and at Reading. Blakemore was by now an established pathologist and he acted as Examiner in this subject for the Royal College of Veterinary Surgeons. His laboratory work and field investigations in collaboration with regional practitioners enabled him to conduct a type of research with which his name will always be associated—clinical examination and investigation backed by a sound knowledge of agriculture, agronomy and pathology. This type was his definition of clinical research and he was its master. Among the problems he studied during this time were lactation tetany and other deficiency diseases, the neuro-lymphomatosis complex in fowls, swine influenza, streptococcal infections, vibrionic infection of sheep, diseases of the new-born calf, while he was the first to identify the presence of fluorosis of animals in this country. These studies, during which he was associated with some 25 publications, gained for him an international reputation and the respect of workers not only in the veterinary, but also in the medical and general science fields. In 1948 he was awarded the Dalrymple-Champneys Cup and Medal which is awarded annually for outstanding work for the veterinary profession. He was also a keen member of the Veterinary Research Club, the proceedings of which are held in esteem in the field of pathology, and in 1947 he acted as President. He was also an active member of the British Veterinary Association, then the National Veterinary Medical Association, and those who remember the successful Congress in 1939 at Yarmouth will know how much was owed to him as Secretary. He was a founder member and one-time Regional President of the Association of Veterinary Teachers and Research Workers. Further during this same active period he served on the Agricultural Research Council Committees concerned with calf diseases, and research into the diseases of pigs and factors influencing health, and in the early summer of 1948 was invited by the Foreign Office to give a course of lectures on post-war veterinary problems at the Veterinary School in Hanover.

It was therefore not at all surprising that in 1948 the University of Bristol appointed Blakemore to organise the School of Veterinary Science they proposed to institute as a result of the deliberations, accepted by Parliament, of the Committee which had sat under the Chairmanship of their previous Vice-Chancellor, Dr. Thomas Loveday. It was a new venture in veterinary education of the highest magnitude, and they needed a person of outstanding quality. Blakemore gave his entire energy to this task. His vast experience in veterinary medicine of all kinds, his association with the educational procedures of the University of Cambridge—he was a member of the Cambridge University Committee on Veterinary Education—his knowledge of agriculture, his appreciation of administrative problems which he gained during his time with the Ministry, and perhaps above all his sterling character, primed him to his great responsibility. When he joined the University all was to be created, and in the short space of seven years the School has been fully established under his guidance.

Blakemore's interests in the University were by no means narrow. He collaborated with many of his

medical and agricultural colleagues in problems common to man and animals, and addressed local Societies on these and other themes. Nor were his activities confined to Bristol. He was one of the two representatives of the University on the Council of the Royal College of Veterinary Surgeons, to which body he gave faithful service. He was a member of the Board of Governors of the National Institute for Research in Dairying, also of the Zuckerman Committee on Precautionary Measures against Toxic Chemicals used in Agriculture, and of the Severn Wildfowl Trust Advisory Committee. He was President of the Society for the Study of Animal Breeding. At the invitation of Sir Ronald Adam in 1951 he became a member of the Veterinary Advisory Panel and member of the British Council, and in 1952 at the invitation of Sir Thomas Dugdale, then Minister of Agriculture, a member of the Agricultural Improvement Council, while he has continued to serve on Committees of the Agricultural Research Council. In 1954 he was invited by the Inter-University Council for Higher Education in the Colonies to serve as External Examiner and to visit the veterinary establishment of the University of Khartoum and, at the time of his death, was concerned with other international projects of vital interest to world economy.

Now, in the prime of his life, Blakemore has been lost. The Langford Laboratories will always remain as a reminder of his work and stature: Langford was Blakemore and Blakemore was Langford. As Professor MacGregor Skene quoted in his address at the Memorial Service held in the village on August 13th—as was said of another so it could be said of Blakemore —" If you would see his monument, look around you."

C. W. O.

News and Comment

THE BELFAST CONGRESS

The programme, handbook containing Agenda, etc., for the Annual General Meeting, and most of the papers to be presented to the Congress were despatched to members of the Association on Friday, August 19th. The two papers that could not be sent then are circulated with this issue of THE VETERINARY RECORD.

THE VETERINARY SURGEONS (DISCIPLINARY COMMITTEE) ORDER OF COUNCIL 1955

On July 11th, 1955, the Privy Council made an Order approving Regulations made by the Council of the Royal College of Veterinary Surgeons, under the Veterinary Surgeons Act, 1948, Sections 14, 28 (1), to fix the term of office of members of their Disciplinary Committee. The Committee consists of eight members other than the Chairman.

The Chairman and all other members are, as a general rule, to hold office for periods of approximately four years, beginning and ending at the first meeting of the Council after the Annual General Meeting of the College in the appropriate year. Where casual vacancies are filled, the term of office of the person appointed is to be so much of the term of the person whose place he takes as remained unexpired.

The Regulations provide especially that, for the eight members appointed in 1955 (other than the Chairman), the term of office of two shall end in each of the years from 1956 to 1959.

ILLEGAL SALE OF PENICILLIN

Ilfracombe magistrates recently imposed a fine of £20 on a local chemist, on a summons issued by the Pharmaceutical Society of Great Britain.

The summons, to which the chemist pleaded guilty, alleged " that being an authorised seller in poisons and within the meaning of the Pharmacy and Poisons Act, 1933, he did unlawfully sell a substance of preparation to which the Penicillin Act applied, namely: intramammary injection of procaine penicillin, at Ilfracombe, on June 16th."

On June 16th the society sent an inspector to Ilfracombe to carry out a check. He sent an agent into the shop, and asked for a packet of the preparation used for treating cows suffering from mastitis. The chemist sold the agent a packet and gave him a receipted invoice.

The inspector then disclosed his identity. In court the prosecution said this chemist and others had been told that they must not supply this preparation without a proper certificate. " It is a thing that cannot be handled just like a packet of fruit salts " counsel added.

SWINE FEVER—REGISTERED VACCINATED HERDS SCHEME

As from October 1st, 1955, the price of swine fever crystal violet vaccine supplied to veterinary surgeons by the Veterinary Laboratory, Weybridge, Surrey will be reduced from 4s. 6d. to 4s. for 10 c.c. Under the Swine Fever—Registered Vaccinated Herds Scheme, farmers should be charged as from that date 4s. for 10 c.c. and 2s. for 5 c.c. Other charges under the Scheme remain the same.

INTERNATIONAL ASSOCIATION OF VETERINARY ANATOMISTS

During the Sixth International Anatomical Congress which took place in Paris from July 25th to 30th, a special meeting was held for all veterinary anatomists present. An International Association of Veterinary Anatomists was formed and Professor Bressou (Alfort) was elected president. Professor Barone (Lyons) accepted the post of secretary. The following day the veterinary anatomists were entertained to lunch by their president who then conducted the party on

a tour of the Alfort Veterinary School. Among those present were Professors Grau (Munich), Koch (East Berlin), Preuss (West Berlin), Scaccini (Italy), Simitch (Belgrade), Doctors Blin (Alfort) and Meyer (Cornell, U.S.A.). Mr. R. N. Smith (Bristol) represented Great Britain at both meetings.

PERSONAL

Births

BOWNASS.—On July 11th, 1955, at Overdale, Springfield, Bentham, to Jean, wife of Robert C. Bownass, B.SC., M.R.C.V.S., a daughter.

COOK.—On August 19th, 1955, at the Barratt Maternity Home, Northampton, to Dolly (*née* Beatrice Cunnington), wife of Edward R. Cook, M.R.C.V.S., of Stoke Bruerne, Northants, a daughter (Julia Edwina).

DINGLE.—On August 8th, 1955, at East Rudham, to Janie, wife of P. J. Dingle, M.R.C.V.S., a son, brother for Frances and Jennifer.

GILLESPIE.—On August 16th, 1955, to Mary, wife of A. C. Gillespie, B.SC., M.R.C.V.S., Aylesbury, a son.

HARRIS.—On August 11th, 1955, at Adeoyo, Ibadan, to Catherine (Rena), wife of G. D. Harris, M.R.C.V.S., Veterinary Officer, Abeokuta, Nigeria, a daughter, Sandra Margaret.

ORR.—On August 3rd, 1955, to Joan, wife of Ronald S. Orr, M.R.C.V.S., "Woodville," Clun Road, Craven Arms, Shropshire, a daughter.

ROBERTSON.—On August 6th, 1955, to Margaret Robertson, M.B., CH.B., wife of A. G. Robertson, B.SC., M.R.C.V.S., of Dunmow, Essex, a daughter.

Marriage

DAVIES—BARNETT.—The marriage took place on Friday, July 22nd, 1955, at Ebenezer Methodist Church, Dolgelley, of Gwilym Prys Davies, M.R.C.V.S., son of the late Mr. and Mrs. Owen Davies, Criccieth, and Jonelt Catherine Barnett, B.A., daughter of the late Mr. Richard Barnett and Mrs. Barnett, Dolgelley. The Rev. O. Prys Davies officiated.

CAPTAIN J. R. BARKER

Mrs. Margaret Hoare writes:—

I have learned with the deepest grief of the passing of Captain J. R. Barker. His qualities were such that it is difficult in a short tribute to do them justice. He possessed the highest of professional ability, together with great personal charm and a never-failing sense of humour.

I have gone to him with many problems, and always I was struck by his faculty for getting straight to the root of the matter, so that in no time, the difficulty had ceased to exist—and how freely was his advice and help always given!

I count it my greatest good fortune that I spent my years as an assistant with him. The profession has lost one of its most able members, and I a most valued friend.

COMING EVENTS

September

2nd (Fri.). Ordinary General Meeting of the South Wales Division, B.V.A., at the Castle of Brecon Hotel, Brecon, 2.15 p.m.

4th to 10th. 73rd Annual General Meeting and Congress of the British Veterinary Association at Belfast.

6th (Tues.). Annual General Meeting and Dinner of the University of Glasgow Veterinary School Alumnus Association at Thompson's Restaurant, Donegal Place, Belfast, 6 p.m.

8th (Thurs.). Summer General Meeting of Eastern Counties Veterinary Society at Cambridge. Tour of Veterinary School. President's Invitation Tea. Shipley Bowls Tournament.

22nd (Thurs.). Meeting of the Essex Division. B.V.A., at the Essex Institute of Agriculture, Writtle, Essex, 7.30 p.m.

30th (Fri.). Meeting of the Welsh Branch, B.V.A., at Aberystwyth.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Derby. Pike House Farm, Thorpe Ashbourne (Aug. 22).

Durham. New Broomielaw Farm, Marwood, Barnard Castle (Aug. 16).

Fife. Newton Hall Farm, Windygates (Aug. 20).

Lancs. Allerton Priory Farm, Woolton, Liverpool (Aug. 22).

Lincs. Usselby Villa, Minting, Horncastle (Aug. 20).

Northants. The Great Oaks Field, Lilford Lodge, Barnwell, Peterborough (Aug. 16).

Staffs. 99 Holding, Brockhurst Lane, Tamworth (Aug. 20).

Yorks. Notton Green Farm, Notton, Wakefield; The Homestead, Hambleton, Selby; Occaney Farm, Copgrove, Harrogate (Aug. 16); Middle Farm, Mappleton, Hull (Aug. 18); Birkley Farm, Little Smeaton, Great Smeaton, Northallerton (Aug. 20).

Fowl Pest

Hunts. Dellas Premises, St. Ives (Aug. 22).

Swine Fever

Denbigh. Tyddyn-y-Graig Farm, Llanelian, Colwyn Bay (Aug. 23).

Derby. 111, Darklands Road, Swadlincote, Burton-on-Trent (Aug. 18); Piggeries, Woodhall Lane, Highmoor, Killamarsh (Aug. 22); Grislow Fields Farm, Curber, Calver (Aug. 23).

Hants. The Warren, Froyle, Alton (Aug. 20).

Herts. Dog Kennel Farm, Lilley (Aug. 20).

Lancs. Southlands Farm, Kirkham Road, Freckleton, Preston (Aug. 22).

Norfolk. Cross Keys Cottage, Brampton, Norwich (Aug. 16); 28, Council Houses, Station Road, Ten Mile Bank, Downham Market (Aug. 22); Bodgers Farm, Middle Drove, Wallington, King's Lynn (Aug. 23).

Renfrews. Strone Farm, Greenock (Aug. 18).

Somerset. 5, West Street, Wiveliscombe, Taunton (Aug. 16); Manleys Farm, Blackmoor, Wellington (Aug. 17); Clevelands Farm, Churchinford, Taunton (Aug. 19).

Staffs. Manor Farm, Colton, Rugeley (Aug. 23).

Sussex. Stroud Farm, Wivelsfield Green, Haywards Heath (Aug. 16); Seven Bells, Old Salts Farm Road, Lancing (Aug. 18).

Warwicks. College Farm, Nether Whitacre, Coleshill, Birmingham; Old Hall Farm, Baxterley, Atherstone (Aug. 17).

Yorks. Jackson Hill Farm, Queensbury, Bradford (Aug. 17); Midfield, Ivyhouse Lane, Wakefield (Aug. 22).

RINGWORM

In the article under this heading last week (pp. 631-634), the addresses of a number of Veterinary Investigation Centres were quoted. We are asked to state that the Newcastle Centre is at Whitley Road, Longbenton, Newcastle-upon-Tyne, 12.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

"RADIONIC THERAPY"

Sir,—I was very interested to read the article on "Radionic Therapy" in your issue of July 30th, and fully expected to see comments from other practitioners.

In the west of England, this "treatment" is known simply as "the box," when applied to horses.

Several colleagues in the district have told me of clients who, when recovery was not as rapid as they wished, have stated that the horse should be "put on the box."

What this term means exactly, I am unable to say, but it seems that all that an owner is required to do, is to forward to a certain address a portion of either the mane or tail of the affected animal, together with a few details of symptoms, etc.

In no time at all, the owner is informed of the nature of the malady and given advice on treatment.

It all sounds quite fantastic, but is nevertheless true; and "the box" can number amongst its customers some of the better known names in the country.

Yours faithfully,

MICHAEL SEARLE.

Chapelgarth,
Old Sodbury,
Bristol.

August 12th, 1955.

PATHOLOGICAL MATERIAL

Sir,—Almost all commercial firms and research institutes which endeavour to serve a profession by organising a diagnostic and consultative service come under fire from time to time, either in connection with the actual service given or the charges made. Of course most of us welcome criticism provided it is based on a sound knowledge of the facts of the case, but all too often this factual knowledge is lacking.

At the Canine Research Station we sometimes get the impression that the only way to avoid criticism of charges is to give a free service, but no organisation can do this unless all material sent to them fits in with a particular line of research or that by giving a free service, the expenses incurred are a mere drop in the ocean of commercial expenditure.

Here we endeavour to provide as complete a diagnostic service as possible, but unfortunately many veterinary surgeons have little or no comprehension of the cost of such a service. Our charges are as low as possible which means that the service is far from covered by financial return. We do not deny that a certain amount of useful data comes to hand from the material sent to us but, nevertheless, from a purely financial point of view we run at a loss in spite of the charges which some people consider high.

If a carcase, for instance, is received here for a full *post-mortem*, bacteriological, serological, histopathological, and virological examination and the carcase disposed of, the actual cost to us in time, labour and material can be as high as £5, and this does not include the cost of laboratory animals such as ferrets which may have to be used.

Unfortunately a lot of time and money is wasted in dealing with material which is received in unsuitable condition. This occurs in spite of the many reminders to the profession, in the form of B.V.A. publications and letters to the veterinary Press. We still receive pieces of lung, liver, kidney and spleen sent in Tate and Lyle Golden Syrup tins (please forgive the advertising!) with no preservative added. May we once again ask the profession to help us and themselves by sending us material taken quickly and cleanly, packed adequately, and in the necessary preservative and dispatched to us with the minimum of delay, especially avoiding transit through the post over a week-end during hot weather. It is always disappointing to us and unsatisfactory from the point of view of the veterinary surgeon and his client if no diagnosis can be made due to the decomposition or damage of material on arrival.

Yours faithfully,

S. F. J. HODGMAN,

Canine Research Station,
Animal Health Trust,
Kennett, nr. Newmarket,
Suffolk.

August 18th, 1955.